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Postoperative Complications in Patients Over 75 Years of Age Undergoing Total Knee Arthroplasty Surgery

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ABSTRACT

Total knee arthroplasty (TKA) is a surgical procedure performed to treat pain, restricted movement, and joint deformity caused by conditions such as osteoarthritis, rheumatoid arthritis, and knee joint trauma. With advancements in healthcare and an increasing aging population, the need for TKA surgeries among geriatric patients has risen significantly. Approximately 75% of TKA patients belong to this demographic, necessitating special attention to perioperative management due to higher frailty and comorbidities.

This retrospective study analyzed the medical records of 75-year-old and older patients who underwent unilateral TKA between April 2018 and April 2023 at a tertiary university hospital. The study employed a retrospective design, analyzing data from patient records, including demographic characteristics, anesthesia types, comorbidities, postoperative complications, and 30-day mortality. A total of 81% of the study participants were women, with the majority categorized in the ASA III risk group (58%). Spinal anesthesia was the most commonly used anesthetic technique (77%), and 54% of patients had two or more comorbidities. Our findings revealed a postoperative complication rate of 73%, with anemia being the most frequent complication (51.2%). Blood transfusions were administered to 34.3% of patients, and the 30-day mortality rate was 0.5%.

This study aligns with existing literature, showing a higher mortality rate in elderly TDP patients compared to younger cohorts, with a perioperative mortality rate of less than 1%. The results suggest that a thorough preoperative evaluation and optimized management of postoperative anemia and comorbidities can enhance perioperative patient outcomes and improve prognosis in geriatric TKA patients.

Keywords: Geriatric Anesthesia, Total Knee Arthroplasty, Postoperative Complications, Mortality

Introduction

Total knee arthroplasty (TKA) is a surgical procedure performed to treat pain, restricted mobility, and joint deformities caused by osteoarthritis, rheumatoid arthritis, and trauma to the knee joint. (1) Considering the increasing economic burden of joint arthroplasty procedures such as total hip arthroplasty and TKA on healthcare systems, it is important to examine the factors affecting postoperative outcomes such as length of hospital stay, morbidity, and mortality. (2) Advances in healthcare and increased life expectancy have heightened the need for these operations among geriatric patients. (3) It has been reported that 75% of patients undergoing TKA are of geriatric age. (4) The increased frailty index and comorbidities accompanying this age group make perioperative management particularly critical. The growing number of arthroplasties and associated expenditures in this population (2) necessitate better identification of patients with high morbidity and mortality risk, optimization of procedure timing, risk reduction, determination of contraindications, and design of pathways for patient education, rehabilitation, and recovery. (5)

Research findings on the effects of age on surgical interventions are conflicting. (6-8) Xuan JI et al. reported a positive correlation between age ≥70 and prolonged hospital stays in patients undergoing TKA. (1) It has been noted that age is a predictor of early complications following joint arthroplasties, with the likelihood of experiencing complications increasing by approximately 40% with each decade of life, although it is not associated with hospital stay duration or readmission rates. (5) Conversely, a meta-analysis indicated that selected geriatric patients undergoing TKA with good functional status and minimal medical comorbidities had similar risks to younger

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patients, and age alone was not a contraindication for knee arthroplasty. (4) The range of complications following TKA is quite broad, ranging from minor skin issues to life-threatening conditions. (9)

Identifying preoperative and postoperative issues in geriatric patients allows us to optimize perioperative patient management. Therefore, in our study, we aimed to determine the comorbidities, the necessity for postoperative blood transfusion, postoperative complications, total hospital stay duration, hospital readmission rates within one month, and 30-day mortality rates of patients aged 75 and older who underwent TKA surgery.

Materials and Methods

This study, approved by the local ethics committee (Protocol No: 2023/24), was conducted by reviewing the records of patients aged 75 and older who underwent total knee arthroplasty surgery at a tertiary university hospital between April 2018 and 2023. The data were collected retrospectively from the hospital's automation system and anesthesia records.

Patients included in the study were those aged 75 and older, who underwent unilateral TKA, had an American Society of Anesthesiologists (ASA) risk score of I-IV, and received either general or neuraxial anesthesia. Patients under 75, those who underwent bilateral TKA, Sixteen patients were excluded from the study due to missing data or revision surgeries.

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Patient demographics, existing diseases and their number (1: single, 2: ≥2 diseases), ASA risk score, anesthesia method (general, spinal, spino-epidural), preoperative and postoperative day 1 levels of hemoglobin (Hb), leukocytes (WBC), platelets, blood urea nitrogen (BUN), creatinine, glucose, C-reactive protein (CRP), neutrophil-to-lymphocyte ratio (NLR), and platelet-to-lymphocyte ratio (PLR) were recorded. Data on whether postoperative blood transfusions were performed, postoperative complications, total hospital stay duration, readmission within one month, and 30-day mortality rates were collected from the hospital database.

As per the standard procedure in our clinic, all patients were monitored in the post-anesthesia care unit for 24 hours postoperatively. Complications occurring during the hospital stay, from the postoperative period to discharge, were considered early complications and recorded. Complications were categorized into eight main groups:

1-Hematological Pathologies: Anemia, thrombocytopenia,

2-Respiratory System: Pulmonary embolism, pleural effusion, low peripheral oxygen saturation (SpO2 < 92), dyspnea, pulmonary edema, atelectasis,

3-Cardiovascular System: Atrial fibrillation, heart failure, coronary artery disease, arrhythmias, angina, hypo/hypertensive attacks,

4-Renal Pathologies: Acute/chronic renal failure, oliguria, anuria,

5-Endocrinological: Hypo/hyperglycemia, hypo/hyperthyroidism,

6-Neuropsychiatric: Delirium, Parkinson's disease, epilepsy, cognitive dysfunction, cerebrovascular events (CVE),

7-Infectious: Fever, urinary tract infections, soft tissue infections, cellulitis,

8-Others: Electrolyte disorders, deep vein thrombosis, rheumatoid arthritis, complications related to spinal anesthesia, elevated liver enzymes.

Statistical Analysis: The data were analyzed using IBM SPSS 25.0. The conformity to normal distribution was examined using the Kolmogorov-Smirnov test. Quantitative variables that followed a normal distribution were expressed as mean ± standard deviation, and categorical variables were expressed as frequency (percentage). The One-Way ANOVA method was used to compare the average hospital stay durations based on the presence of comorbidities in patients. The Paired Samples T-Test was used to compare the preoperative and postoperative laboratory results of the patients. Comparisons were considered statistically significant when the probability (p) value was less than 0.05 ($p<0.05$).

Results

Among the 210 patients included in the study, 81% were female, and 19% were male, with a mean age of 77.82 ± 3.02 years. There was no significant difference in the mean age between females and males ($p=0.943$). None of the patients were in the ASA I risk group. It was observed that

Table 1: Demographic Data

Demographic features	
Age (years) (Mean ± Std)	77.82±3.02 (75-92)
Gender	
Female n (%)	170 (81)
Male n (%)	40 (19)
ASA Physical Risk Score (n, %)	
II	87 (41,43)
III	121 (57,62)
IV	2 (0,95)
Number of Comorbidities (n, %)	
Single disease	61 (29)
≥2 diseases	114 (54,3)
None	35 (16,7)
Anesthesia Method	
	9 (4,3)
General anesthesia	163 (77,6)
Spinal anesthesia	38 (18,1)
Combined spino-epidural anesthesia	
Hospital Stay Duration (days) (min-max)	11.18±2.63 (5-22)
Readmission within 1 Month (n, %)	9 (4,28)
30 Day Mortality (n, %)	1 (0,5)

Table 2: Frequency of Comorbidities

Comorbidities	n (%)
Hypertension	140 (42,4)
Diabetes Mellitus	42 (12,7)
Coronary Artery Disease	34 (10,3)
Chronic Obstructive Pulmonary Disease (COPD)	23(7,0)
Atrial Fibrillation	18 (5,5)
Parkinson's Disease	16(4,8)
Asthma	13 (3,9)
Cerebrovascular Event	11 (3,3)
Depression	7 (2,1)
Chronic Renal Failure	8 (2,4)
Hypothyroidism	7 (2,1)
Heart Failure	5 (1,5)
Rheumatoid Arthritis	3 (0,9)
Epilepsy	2(0,6)
Deep Vein Thrombosis	1 (0,3)
Total	330 (100)

17% (n=35) of the patients did not have any comorbidities but were classified as ASA II risk group due to smoking and anemia. The distribution of ASA risk groups, number of comorbidities, anesthesia method, hospital stay duration, readmission within one month, and 30-day mortality rates are shown in Table 1.

The frequency of comorbidities is presented in Table 2.

Table 3: Hospital Stay Durations by Number of Comorbidities

	n	Mean ±Std	Min.-ax.	Test Statistics	
				F	p
Single Disease	61	11.00 ± 2.54	5-19	1,469	0.233
≥2 Diseases	114	11.44 ± 2.81	7-22		
No Disease	35	10,63±2,10	6-16		
Total	210	11,18±2,63	5-22		

OneWayAnova

Table 4: Comparison of Preoperative and Postoperative Laboratory Values (Mean ± Std)

	Preoperative	Postoperative	p
Glucose (mg/dL)	112.04 ±35.96	129.69±31.33	0.000
Hemoglobin (gr/dl)	12.94±1.41	10.17±1.04	0.000
Hematocrit (%)	38.76±4.16	30.45±3.27	0.000
Leukocytes (mm^3)	6.50±1.69	8.90±2.66	0.000
Platelets ($10^3/\mu L$)	229.31±59.57	184.13±45.60	0.000
Neutrophil-to-Lymphocyte Ratio	2.15±1.04	5.65±3.11	0.000
Platelet-to-Lymphocyte Ratio	127.49±46.42	146.29±60.14	0.000
C-reactive Protein (mg/dL)	4.76±8.52	66.95±68.39	0.000
Creatinine (mg/dL)	0.82±0.24	0.90±0.34	0.000
Blood Urea Nitrogen (mg/dL)	21.36±9.09	21.12±6.90	0.671

Paired Samples T-Test

Table 5: Frequency of Postoperative Complications

Complication	n (%)
Anemia	108(51,2)
Respiratory System Complications	37 (17,5)
Cardiovascular Complications	17(8,1)
Hyperglycemia	15 (7,1)
Acute Renal Failure	14 (6,7)
Infection	7(3,3)
Neurological Complications	7 (3,3)
Spinal Anesthesia Complications	3(1,4)
Electrolyte Imbalance	2(0,9)
Deep Vein Thrombosis	1(0,5)

When hospital stay, durations were analyzed based on the number of comorbidities, no significant difference was observed (F: 1.469; Table 3).

When comparing preoperative and postoperative laboratory values, statistically significant positive or negative changes were observed in all parameters except BUN. Notably, hemoglobin and hematocrit levels decreased postoperatively, while inflammatory markers such as CRP, NLR, and PLR significantly increased (Table 4).

The frequency of postoperative complications was 73% (n=153), as detailed in Table 5.

No significant difference was found in hospital stay durations between patients with and without postoperative complications (p=0.215). Seventy-two patients received a blood transfusion, while

138 (65%) did not. The postoperative 30-day mortality rate was 0.5% (n=1). The deceased male patient (aged 78) underwent spinal anesthesia (ASA III), and the cause of mortality was determined to be cardiac-related.

Discussion

Women comprised 81% of the patients included in our study. We frequently identified ASA III risk group (58%), spinal anesthesia as the applied anesthesia method (77%), and the presence of two or more comorbidities in 54% of patients. We determined the frequency of postoperative complications as 73%, with anemia being the most common complication (51.2%). Blood transfusion was administered to 34.3% of postoperative patients, and the 30-day follow-up mortality rate was identified as 0.5% (n=1).

In geriatric patients, it has been reported that total joint arthroplasty (TJA) surgery is performed more frequently in women (63%) and that spinal anesthesia is preferred over general anesthesia (5-12). The fact that TJA surgery in our study was performed in 81% of women and under spinal anesthesia in 77.6% of cases suggests that our results align with the literature.

Mortality rates in elderly patients undergoing TJA surgery vary, ranging from in-hospital mortality to mortality several years after the procedure. It has been reported that mortality is significantly higher in elderly patients compared to younger ones, but the absolute perioperative mortality remains below 1% (13-15). The 30-day mortality rate in our study was 0.5% (n=1), observed in a 78-year-old male patient, whose cause of mortality was identified as cardiac events.

In the study by Clement et al., hypertension, either alone or with other comorbidities, was reported as the most common accompanying condition in 76% of geriatric patients undergoing TJA (12). Numerous studies have shown that cardiac diseases, including hypertension, arrhythmias, and ischemic heart disease, are common comorbidities in elderly patients undergoing total joint arthroplasty (16-18). In our study, 71% of the patients had comorbid conditions, with hypertension (42.4%) being the most common, consistent with the literature.

It is known that geriatric patients with hypertension are more likely to experience poorer surgical outcomes (19-21). Conditions such as heart failure, COPD, and cerebrovascular events are associated with longer hospital stays (5). Studies reporting the length of hospital stay in primary TJA surgery indicate an average of 2–20 days for elderly patients (22-24). In our study, the average hospital stay was 11.18±2.63 days, consistent with the literature. The relatively longer hospital stays may be attributed to the presence of comorbidities and the inclusion of postoperative physical therapy programs before patients are discharged when they can walk stably.

The incidence of postoperative complications in geriatric patients undergoing TJA surgery has been reported to range from 19% to 64% (5,12,25,26). Comparing postoperative complications is challenging due to variations in the complications assessed and the timeframes covered (9). The postoperative complication rate in our study was found to be high (73%). All complications during the hospital stay were recorded. This difference may stem from the fact that while prior studies often report major complications, we also defined anemia as a complication, diverging from the literature. Postoperative anemia was the most frequent complication (51%). Similarly, in the study by Higuera et al., which reported a comparable complication rate (64%), postoperative anemia incidence was noted as 34% (5).

Fang et al. reported that in total joint arthroplasty, the 30-day readmission rate for all causes increased from 2.8% in patients aged 70 years to 4.4% in those aged 71–80 years and 4.8% in those aged over 81 years (27). Another study reported a 30-day readmission rate of 5.8% (5). The 30-day readmission rate in our study was 4.28%, consistent with the literature. Nine patients were readmitted within 30 days, most frequently due to infectious causes.

Total joint arthroplasty can result in significant blood loss, increasing the risk of blood transfusion during the perioperative period (28). Reported transfusion rates for TJA range from 11% to 19.6% (29,30). Jiang et al. reported a transfusion rate of 12.5% in geriatric patients undergoing total joint arthroplasty (28). Gregory et al. reported a transfusion rate of 71% in patients aged 80 years and older undergoing TJA (31). There is a strong relationship between low preoperative hemoglobin levels and postoperative transfusion, making preoperative Hb optimization critical (32). The postoperative transfusion rate in our study was high (34.3%). Factors influencing this rate may include the average age of the patients, transfusion thresholds, and preoperative Hb levels.

Limitations of this study include its retrospective design, being a single-center study, and involving a relatively small patient population.

We believe that a detailed preoperative evaluation and the optimization of early diagnosis and treatment of postoperative complications, particularly postoperative anemia, will contribute to improving perioperative patient management and postoperative prognosis in geriatric TKA patients.

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